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whose habits varied as their out-of-door allies do at present. Had they been specially created for subterranean life, we should have expected a much greater uniformity in the organs adapting them to a cave life than we actually find to be the case.

Another fact of interest in this connection is the circumstance that these cave species breed slowly, being remarkably poor in individuals; they are nearly all extremely rare. Did they breed as numerous as their allies in the outer world the whole race would probably starve, as the supply of food even for those which do live is wonderfully limited.

It is now known that animals inhabiting the abysses of the sea are often highly colored: light must penetrate there, for we know that were the darkness total they would be colorless like the cave insects.

In view of the many important questions which arise in relation to cave animals, and which have been too imperfectly discussed here, we trust naturalists the world over will be led to explore caves with new zeal, and record their discoveries with minuteness, and the greatest possible regard to exactness. The caves of the West Indian Islands should first of all be carefully explored. Also those of Brazil, those of the East Indies, and of Africa, while fresh and most extended explorations of our own Mammoth Cave should be made, perhaps by a commission acting under government or State authority, in order that the most ample facilities may be afforded by the parties owning the cave.

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## A SINGING HESPEROMYS.

BY REV. SAMUEL LOCKWOOD, PH. D.

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SOME twenty years ago, it was, that the "London Charivari" shot its shafts of ridicule at a singing mouse on exhibition in the metropolis. Thus put upon the scent, the firm of Pooh, Pshaw & Co., whose merciless power is alike feared by philosopher and peasant, "went for" the showman and his "phenomenon."

And so hard was the *punch*-ing,  
 And such was the fuss,  
 That it quite put an end  
 To that musical *mus*!

Albeit the miserable end of poor *Mus musculus*, we are bold to declare our knowledge of the existence of singing mice of the above domestic sort; and farther, our belief that they are not very uncommon. But we now propose to introduce to the readers of the NATURALIST an aristocratic, and entirely new candidate for their consideration—a musical wood-mouse.

Last spring, my friend Philip Ryall, Esq., brought from Florida a mouse which he had captured in his residence there. He says that for a number of nights, a low sound of a more or less musical nature, had been heard proceeding, as was supposed, from the chimney, and which very naturally was attributed to the chimney swallow. One day a small mouse came from under the hearth into the middle of the floor of the sitting-room, sat up, and sang for about a minute, and retired. This explained the mystery. Its nightly music and its daily visit were continued, almost invariably, the visit being limited to the same small area of the floor. It was determined to capture the little stranger; which after many unsuccessful efforts was finally accomplished. Last June the interesting little fellow was very kindly passed into my custody. My first concern was to add to its comfort by enlarging its cage, also to provide for it in every possible way a condition of things suited to its nature. For all this I was amply rewarded in the fine health, and the musical performances that followed.

A little study soon determined that the pretty creature belonged to the vesper mice. It is known by the popular names of jumping mouse, wood mouse, and white-footed mouse. Our specimen is one of the smallest of its own genus, for the precise species is the one known to naturalists as the *Hesperomys cognatus* Leconte. This fact, so novel, once determined, gave additional zest to my purpose to make it the object of especial study. To give it individuality, as it was fast becoming a pet, I named it Hespie; which name, as its object was a female, was certainly appropriate. I thought she soon learned to know me, and certainly I soon came to regard her with attachment. Yet, the truth told, she was a pretty, pert and unamiable little miss, and would permit no familiarity, always biting the finger that attempted to touch her. Her animation, agility and gracefulness of motion were wonderful. Sometimes a fly would enter the cage, when she would spring at, and catch it, sometimes with her mouth, and at others with her hands. This she would eat with great relish. So uniformly quick were her motions, that on

one occasion my little boy said : "Papa, I would like to see mousie *walk* just once." Her taste was quite omnivorous ; although unlike the domestic mouse, she did not care much for cheese. But meat, bread, corn, nuts, sugar, and even pudding and fish were all acceptable. A little sod of fresh grass and white clover was occasionally put into the cage. This she enjoyed greatly, eating the greens like a rabbit ; only always insisting on sitting up to do it. It was interesting to witness how ready she was for emergencies. Sitting on her hind feet, she would take hold with her hands of a blade of grass, and begin eating at the tip. The spear would rapidly shorten, and seemingly she must now stoop to finish it, or do it in the ordinary quadrupedal style. Now that was just what she did not choose to do. So when the emergency came, she would stoop down, and in a trice cut the blade off close to the sod with just one nip ; then up again on her feet in a sitting posture, she would finish it in a comfortable and becoming way. On one occasion a worm crept out of the sod, and Hespie at once fell to it and soon had it tucked away without cooking. As to exercise, she manages to take a great deal. In the day time her exercise is less, as she does a good deal of sleeping then. It is at night that her peculiar talents appear to advantage, beginning at vespers, as her name might imply. Then, as a singer, her genius literally shines. It is with her singing that we are the most concerned ; and indeed, at the moment of this writing (for it is night) she is in fine song. Perhaps, however, it will seem more literal and actual if her performances are described in the past tense.

Our little musician had several snatches or bits of melody which were often repeated. But in her *repertoire* were two notable ones, each of which deserves to be dignified as a professional *role*. The one by far the more frequent is notated below ; and because it is her favorite, when running in her revolving cage, I have named it *The Wheel Song*.\*

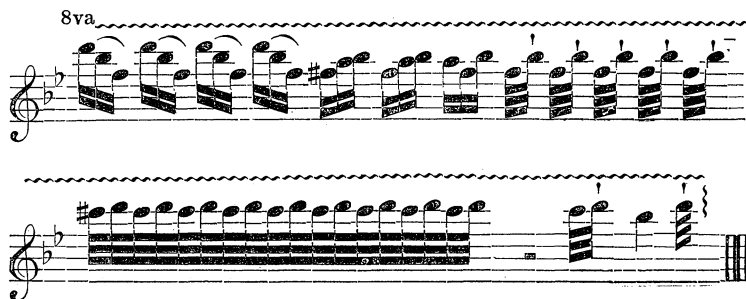
The last bar of this would frequently be prolonged to two or three ; and she would sometimes change from C sharp and D, to C natural and D, then warble on these two notes awhile, and wind up with a quick chirp on C sharp and D. The distinctness between the semitones was very marked, and easily appreciable to a good ear. I have always enjoyed the mellow little strains of the song sparrow and the house wren. But in either case it was short, and

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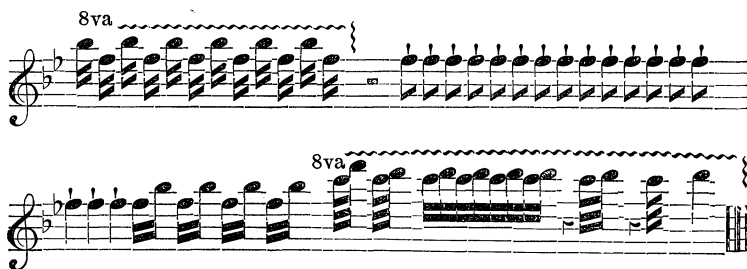
\*The musical notation was written by my son, Ferris C. Lockwood.

apt to become monotonous from its admitting almost no variation. Monotony was not chargeable to Hespie's Wheel Song. With unconscious skill she would work out of it a wonderful variety. Instead of the first measure she would sometimes open with the second one, then follow it with the first. Or she might start with the third, following with the second, or the first, just as fancy seemed to dictate. Then she had her own whims as to the amount of repetition of each bar; that is to say, she would double or even

### NO. 1. THE WHEEL SONG.



### NO. 2. THE GRAND ROLE.



triplicate a measure, when the notion took her. In this regard, time was quite ignored. Indeed, whatever may have been the Hesperomys' canon of musical procedure or propriety, we could not but regard it as arbitrary, or beyond our comprehension. Still it must be admitted, that this little performer possessed precision, delicacy, and scope of execution.

She had one role, which although the notation is simpler than that of the Wheel Song, yet I think to her its execution was more

difficult. It is certain that she was far more chary of its performance; and to me its effect seemed more impressive. I have on account of its less frequency distinguished it as *The Grand Role*.

This was seldom given, yet quite often enough to allow it to be written down. The second measure would be sung quite fast, sounding almost like the pecking of the woodpecker on the tree; and at other times it would be slow like the dropping of water. Although she had no ear for time, yet she would keep to the key of B (two flats), and strictly in a Major key. This fact I considered interesting, as Wood declares his belief "that the untaught cries of all the lower animals, whether quadrupeds or birds, are in the Minor key." Herein theory must yield to observation. If I might venture an opinion, it would be that the music of the really musical wild animals is oftener on a Major key; while the Minor key characterizes savage man. A remarkable fact in the above *role* is the scope of little Hespie's musical powers. Her soft, clear voice falls an octave with all the precision possible; then at the wind-up, it rises again into a very quick trill on C sharp and D.

Though it be at the risk of taxing belief, yet I must in duty record one of Hespie's most remarkable performances. She was gambolling in the large compartment of her cage, in a mood indicating intense animal enjoyment, having woken from a long sleep, and partaken of some favorite food. She burst into a fulness of song very rich in its variety. While running and jumping, she rolled off what I have called her Grand Role, then sitting, she went over it again, ringing out the strangest diversity of changes, by an almost whimsical transposition of the bars; then without for an instant stopping the music, she leapt into the wheel, started it revolving at its highest speed, and went through the Wheel Song in exquisite style, giving several repetitions of it. After this she returned to the large compartment, took up again the Grand Role, and put into it some variations of execution which astonished me. One measure I remember was so silvery and soft, that I said to a lady who was listening, that a canary able to execute that would be worth a hundred dollars. I occasionally detected what I am utterly unable to explain, a literal dual sound, very like a boy whistling as he draws a stick along the pickets of a fence. So the music went on, as I listened, watch in hand, until actually *nine minutes had elapsed*. Now the wonderful fact is that the rest between the roles was never much more than for a second of time;

and during all this singing the muscles could be seen in vigorous action through the entire length of the abdomen. This feat would be impossible to a professional singer; and the nearest to it that I have seen was the singing of a wild mocking bird in a grove.

For several days the wheel grated on its axle. This afforded Hespie great delight; and her own little warble was completely lost in the harsher sound. It was pretty much as it is with some of the modern methods of praise; as when the vocal is subordinated to the instrumental, a mere murmur of song, on which the organist comes down as with the sound of many waters. A drop of oil, and the sound of the friction stopped. This quite excited her temper; and she bit the wires of her wheel most viciously. A little device was hit upon which set her in good humor again. A strip of stout writing paper, a half inch wide, was pinned down in such a way that its clean cut upper edge pressed against the wires of the wheel, making with its revolution a pleasant, purring sound. It was on the principle, exactly, of the old-time watchman's rattle, and the old toy known as a cricket. This for a while greatly delighted the capricious creature, and she made the wheel almost fly; at the same time, in unison with the whirr of the wheel, was her own soft, cheery warble. It was very low, yet very distinct. I remember once on a larger scale witnessing an analogous sight, when, unseen, I entered a room in which was a woman spinning wool, and singing at the top of her voice, in keeping with the loud whirring of her spinning wheel. Without her wheel the domestic life of little Hespie would be rather monotonous. Expecting to see some antics in the slipping line, the trick was tried of covering a part of the inside of the wheel with smooth sized paper. Mousie entered and started the wheel, and in the prettiest way jumped the smooth paper floor at every revolution, actually keeping the propulsion up with but a slight diminution of the usual speed. This was certainly a very pretty feat. We next shut her out by corking up the entrance. She worked desperately at the closed aperture; then in despair gave vent to a piercing little cry. It was surprising what a strange pleasure this sound afforded me; it showed so clearly the difference in the timbre or quality of this sound of distress from that which I have called its singing. She was a good deal excited, and ran frantically into and out of her little bed-box, which had a hole at each end. Soon this tiny gust of rage passed over. She

now, although running about her cage, indulging in little gambols, indicating exquisite grace and agility, struck off into a truly beautiful strain of song. It occupied about three minutes, and had in it considerable scope and variety. First there was a clearly enunciated expression like that of the cooing of a turtle dove, a soft note, with a deliberate slowness. This changed into a series of more rapid notes strangely suggesting, though not so weird-like, the conchy clamor of the American cuckoo (*Coccyzus*), then closing with a series of short, rapid sounds, like the tapping of the woodpecker on a tree.

A very noticeable fact was, that a great deal of this little creature's song was poured forth while at play—that is, while in actual activity; and, take the wheel-play, for instance, when really in quite violent exercise. A thing, too, which much surprised me, was, that often when eating she sang and ate at the same time, literally in the same breath. This singular habit, so suggestive of a great physiological difficulty, led to an incident, which caused considerable merriment for those who witnessed it. I had been examining some insect larvæ on a twig of black alder. Without any real motive, a bit of the twig, about an inch long, and an eighth of an inch thick, was offered to Hespîe. She was delighted, and at once began in her usual pretty way, sitting up, to eat the bark, although it is very bitter. Thus she sat “bolt upright;” and the manner in which she held this little black stick in both hands up to her mouth, at the precise angle in which a fife is held, although nibbling away, yet singing at the same time, it looked so like a little fifer playing on an ebony fife that laughter was irresistible at the comical sight.

Wishing to see how this *Hesperomys* would behave in company, I put into her cage a young domestic mouse about one-third grown. She was asleep in her little box. When she woke, it was a pretty sight. What animation! How the black eyes started and sparkled! To me they seemed to snap with fire. The whole frame was in a quiver—first of astonishment, then with rage. It was not a run—but a jump which she made at the little involuntary intruder, who received a nip that made it squeal in terror. We removed the little captive, who was so astonished that it was quite content to lie in our hand. Its terror had won our pity, and we restored to it its liberty. I had a friend who had once a singing domestic mouse, of very moderate musical ability, however. But



one day he captured two specimens of the white-footed mouse (*Hesperomys leucopus*), and supposing it would be good company, he put them into the cage. Great mistake it was. The two white-footed barbarians abused the hospitality, and murdered poor *Mus musculus*.

And now we ask are these phenomena that have been herein described the result of an abnormal condition of things or not? How much truth is there in the theory of some that the singing of these mice is the result of disease, or of some bronchial disturbance? In my opinion the following reasons disprove the truth of any such theory.

1. The exquisite animal enjoyment, and actual physical condition, for it is fat, and perfect in pelage and form, indicating high health. Every form of bronchial disease is in its most ordinary effect depressing to the animal spirits.

2. When engaged in song, the exercise reaches to the very depth of the chest, as is so often seen in the lowing of kine, where the muscles may be observed in action for the whole length of the abdomen. Persons afflicted bronchially avoid deep vocal exercises.

3. The singing is so often performed under those precise circumstances in which bronchially diseased persons are sure to keep still, if possible. For instance, take the Wheel Song. Here, although the exercise was violent, yet the song would be sustained all through with no diminution of vocal strength; and quite frequently was it the case, that when the animal stopped turning the wheel, though it continued the song, the momentum would throw it on its back, when as if in surprise, it would roll off four or five notes on a higher octave, and in a greatly increased loudness of voice.

4. Our vesper mouse delights in a role, the performance of which argues these three facts:—A high organization of the organs of the voice; delicate and skilful adjustment during use; a perfect condition as respects health. She can sing and eat at the same time. When a boy the writer was fond of whistling, usually selecting some ballad tune; and it was with perfect ease that the strain was continued through an entire stanza, without any break for the sake of getting breath; for ere the expiring air had become exhausted, he inverted the process, thus continuing his strain by the inspiring air as it came through the orifice formed by his lips. He also remembers that it was said of Jenny Lind that she could

use the inspiring breath in singing, though he cannot vouch for the fact. Now this fact, in the case of our *Hesperomys*, that it could eat and sing at the same time, even admitting, what is probably true, that there are intervals of a very short duration (so short as to be almost undiscernible) when the epiglottis closes to allow the food to pass down the gullet, demonstrates, as we think, that the organization of those parts was very delicate, and that the whole organism was in the very highest condition of health. We say nothing about that dual vocalization, other than that we think it looks in the same direction.

Probably it may occur to some that the pathology could be better demonstrated by dissection. To us it hardly seems that such a proof is needed. But I confess to a desire for all possible knowledge from such a source as respects certain physiological questions which I feel impelled to propose. In the human ear is a stringed instrument of amazing delicacy. The physiologist calls it the *Fibres of Corti*. It is wonderfully suggestive of the strings and keys of a piano; and it is believed that it ministers to the musical function. Query: has our little musician this mysterious organ? If so, in how much is it like that possessed by man? And as *Hespie* lacked time in her music, and as all animals, other than man, lack harmony, is this delicate organ consonant with that defect? Alas! we may not bring to this matter, though under our hands and our eyes, processes of investigation so delicate as the astronomer applies to matter far distant in space.

We would not run into the vice of generalizing on too scanty a stock of facts. Yet we are disposed to think that as an order the rodents possess a large amount of undeveloped ability for musical utterance. Few of us are aware to what extent among the domestic mice singers abound. Singing rats also have been observed. We have now the *Hesperomys*, thus affording three well marked genera of the *Muridæ*. Of the *Sciuridæ*, or squirrels, I can only speak of three genera with certain knowledge—the gray squirrel, the chipmunk, and the flying squirrel. All these are capable of musical sounds, though not to be called singers. And there is also the whistling of the woodchuck in its burrow. Last summer I caught a young rabbit in a patch of wild lupines, and was struck with the silvery musical ring of its cry, when my hand touched it. It is worth asking how far man's training or culture could develop and improve this potentiality or latent power in the rodents to

sing. My friend, who caught the object of this article, is firm in the belief that on one occasion it made, not without some success, an effort to imitate the canary. If this is a fact, it would of itself prove much in the direction of these remarks.

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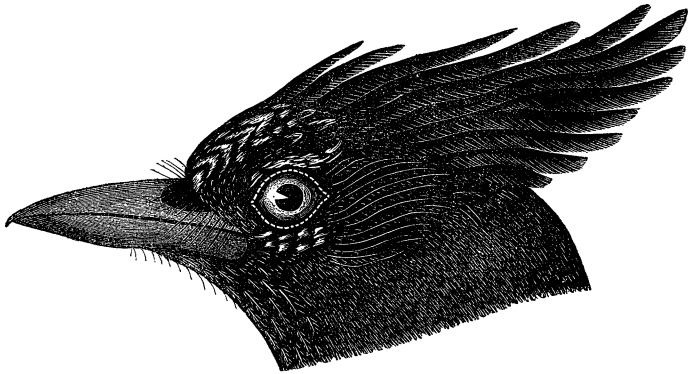
## THE LONG-CRESTED JAY.

BY ELLIOTT COUES.

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THIS bird is the *Cyanura macrolopha* of naturalists, and the genus it belongs to is distinguished among our jays by the ele-

Fig. 134.



The Long-crested Jay.

gant crest that all the species possess, as well as by the rich blue color that shows particularly on the wings and tail, which are also barred with black. This group of birds will be immediately recognized, when we say that the familiar blue jay of the eastern United States is the type of the whole; there are only half a dozen species, among which the common eastern species stands a little apart, being ornamented with richer and more variegated colors, and inhabiting a different zoological province. In the west it is represented by two kinds, Steller's and the Long-crested, so much alike that they might be considered as one species; the last named runs into the *C. coronata* of Mexico, and this into a South American kind called *C. galeata*; while from these last